

1/11

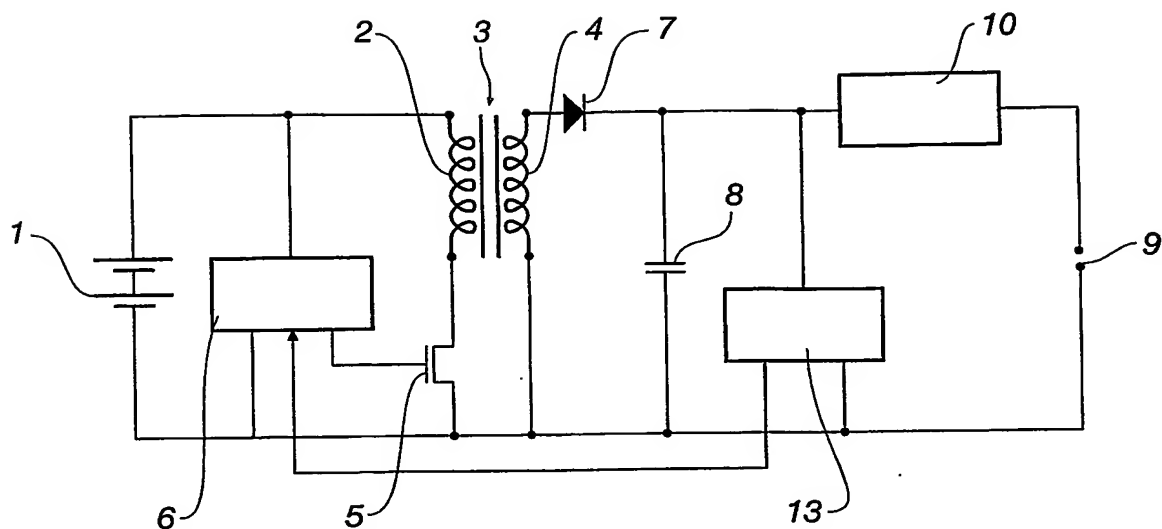


Fig 1
(Prior Art)

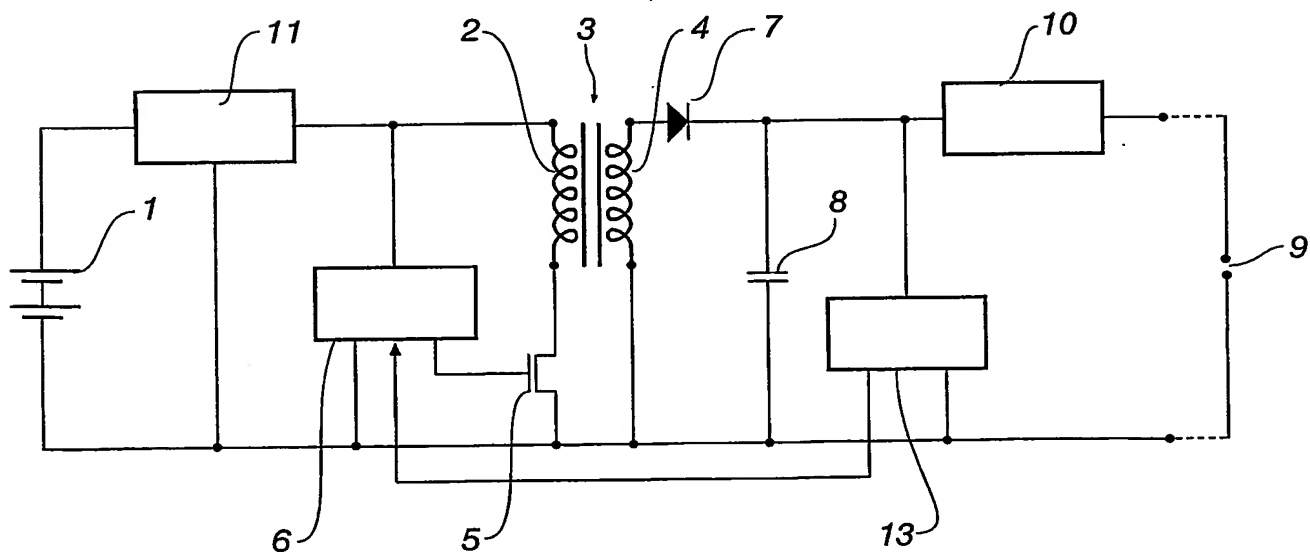


Fig 2
(Prior Art)

2/11

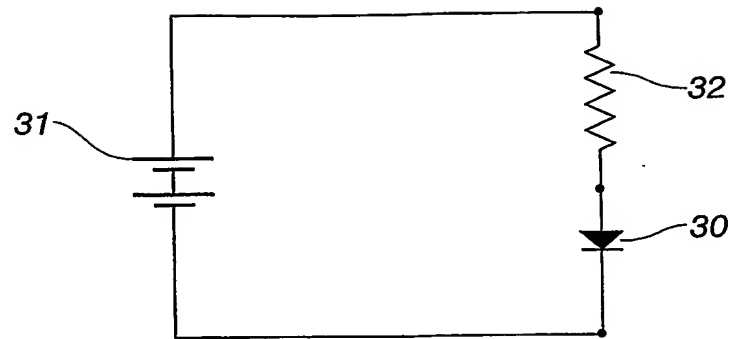


Fig 3
(Prior Art)

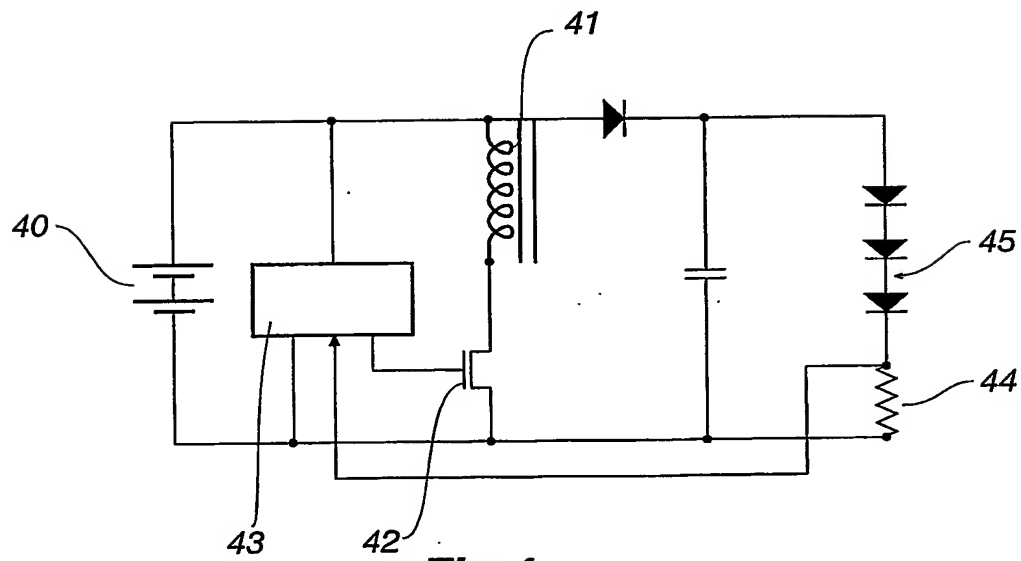
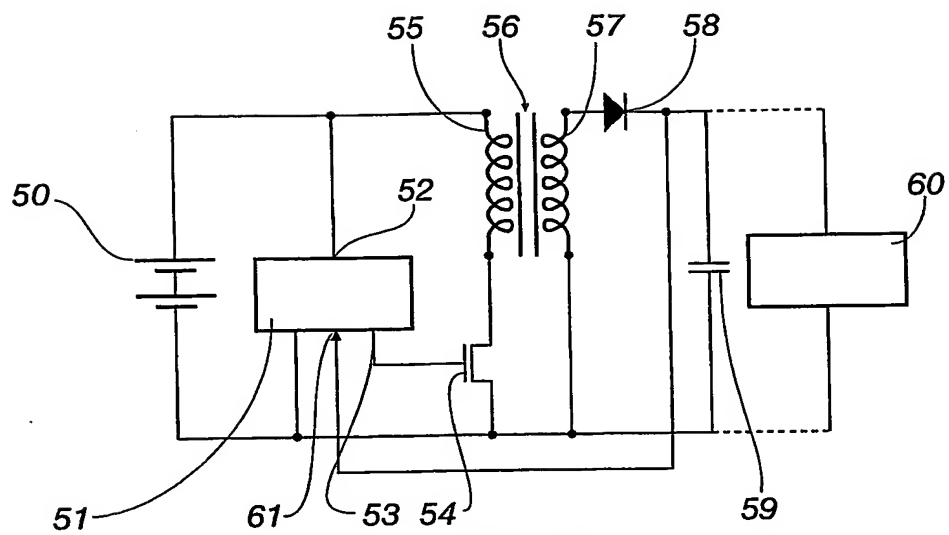


Fig 4
(Prior Art)

3/11

**Fig 5**

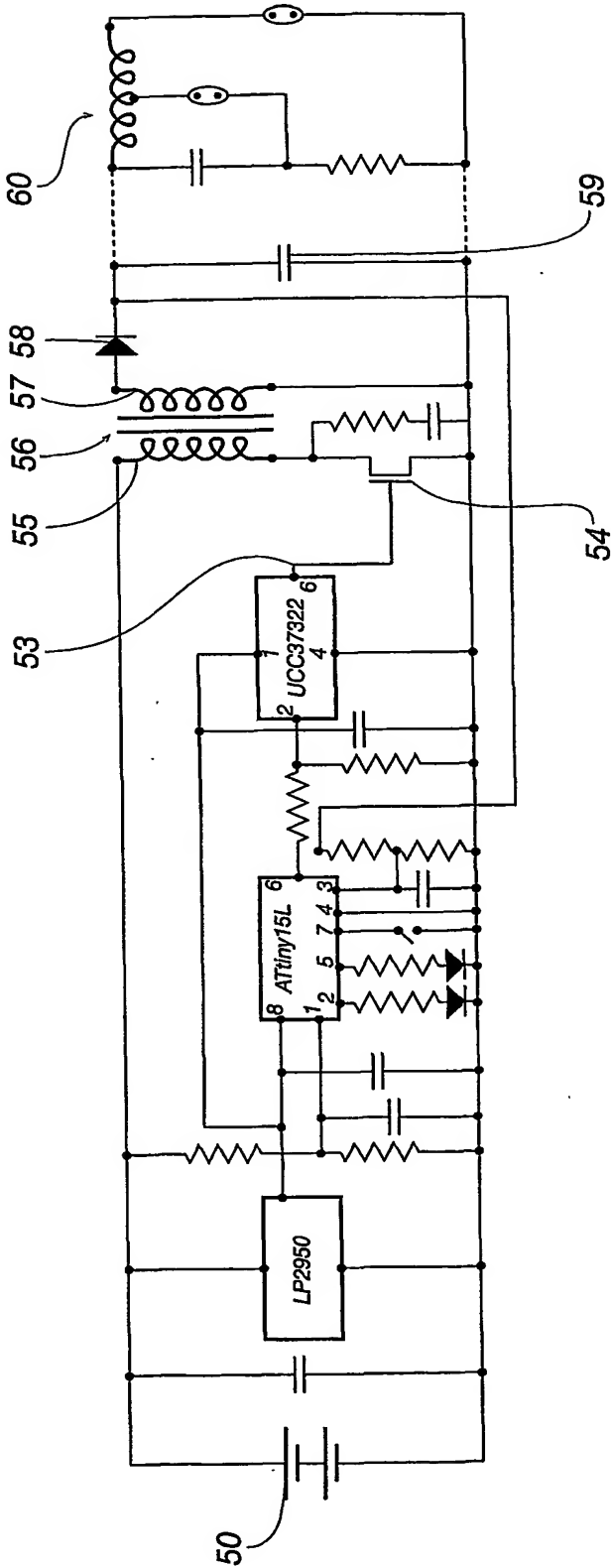


Fig 6

5/11

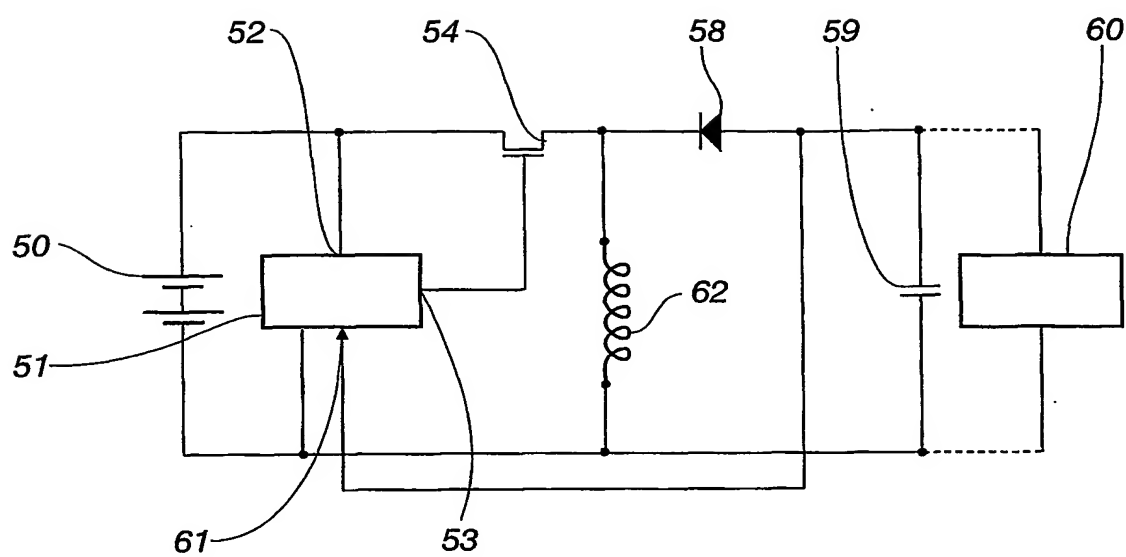


Fig 7

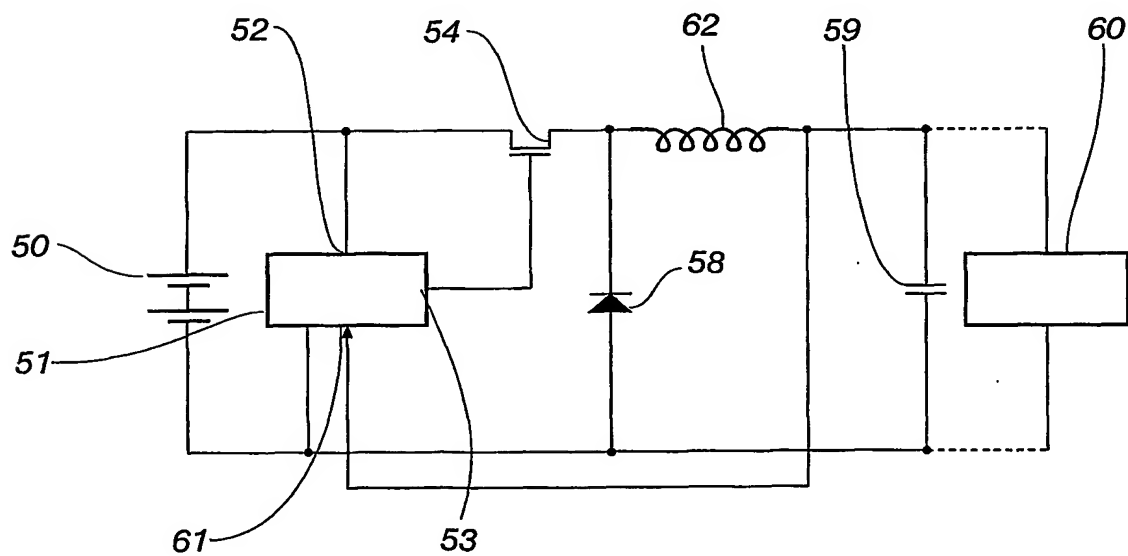


Fig 8

6/11

```

R JMP      +0x0118
R JMP      +0x0100
NOP
NOP
NOP
R JMP      +0x0101
NOP
NOP
R JMP      +0x0160

```

; look-up table inserted here

; Look-up routine

```

SUBI      R17,0x6C
SBCI      R18,0x01
BRCS      +0x0E
BST       R29,5
BRTS      +0x03
LDI       R30,0x12
LDI       R31,0x00
R JMP      +0x0005
SUBI      R18,0x01
LSR       R18
ROR       R17
LDI       R30,0x12
LDI       R31,0x01
ADD       R30,R17
ADC       R31,R18

```

Fig 9

; Fetch duty cycle from table

```

LPM
RET
CLR       R0
RET
R JMP      +0x0019
IN        R5,0x3F
CLR       R6
OUT       0x3B,R6
OUT       0x3F,R5
RETI

```

```

IN        R5,0x3F
INC       R23
DEC       R19
DEC       R22
IN        R9,0x16
BST       R9,2

```

```
SBRC      R16,0
CLR       R29
LDI       R16,0x30
OUT       0x35,R16
LDI       R16,0x13
OUT       0x17,R16
SBI       0x18,2
SBI       0x18,4
LDI       R16,0x10
OUT       0x21,R16
LDI       R16,0x00
OUT       0x21,R16
LDI       R30,0xFF
LDI       R31,0x03
LPM
OUT       0x31,R0
CLR       R0
LDI       R16,0x8B
OUT       0x6,R16
LDI       R16,0x61
OUT       0x30,R16
LDI       R16,0xFF
OUT       0x2D,R16
LDI       R16,0x04
OUT       0x33,R16
LDI       R16,0x02
OUT       0x39,R16
LDI       R16,0x60
OUT       0x3A,R16
CLR       R16
OUT       0x34,R16
RET
```

Fig 9

8/11

BRTC	+0x07
ORI	R29,0x08
MOV	R16,R0
LSR	R16
LSR	R16
SUB	R0,R16
MOV	R7,R0
CLR	R10
ANDI	R17,0xC0
ADD	R17,R17
ADC	R18,R18
ADC	R17,R17
ADC	R18,R18
ADC	R17,R17
MOV	R16,R18
MOV	R18,R17
MOV	R17,R16
RCALL	-0x00BE
BST	R29,3
BRTS	+0x02
BST	R29,2
BRTC	+0x07
MOV	R16,R0
LSR	R16
LSR	R16
SUB	R0,R16
CP	R7,R0
BRCS	+0x01
MOV	R7,R0
CP	R20,R0
BREQ	+0x02
BRCS	+0x04
BRCC	+0x07
SBRC	R29,3
MOV	R20,R7
RJMP	+0x0005
INC	R20
SBRC	R29,3
MOV	R20,R7
RJMP	+0x0001
MOV	R20,R0
OUT	0x2E,R20
CLR	R17
CLR	R18
CLR	R4
CLR	R28
RJMP	-0x00C4
IN	R16,0x34

Fig 9

SBIS	0x7,1
RJMP	-0x000B
IN	R26,0x4
IN	R27,0x5
CBI	0x7,1
SBI	0x6,6
ADD	R4,R26
ADC	R28,R27
INC	R3
SBRS	R3,6
RJMP	-0x0070
CLR	R3
BST	R29,0
BRTS	+0x03
CLR	R18
CLR	R17
RJMP	+0x0049
MOV	R8,R18
ANDI	R29,0xBF
CPI	R28,0x46
BRCS	+0x03
ORI	R29,0x40
SBRS	R29,1
RJMP	-0x0067
CPI	R18,0xFF
BRCC	-0x1C
CPI	R18,0x9B
BRCS	+0x02
ORI	R29,0x20
RJMP	+0x0005
ANDI	R29,0xDF
CPI	R18,0x64
BRCS	+0x02
ORI	R29,0x10
RJMP	-0x0072
BST	R29,1
BRTS	+0x13
MOV	R24,R18
SUBI	R24,0x64
ADD	R24,R24
ADD	R24,R24
LSR	R24
BST	R29,3
BRTS	+0x0C
CPI	R18,0x78
BRCC	+0x09
INC	R10
BST	R10,7

Fig 9

10/11

```

BRNE    -0x05
ANDI    R29,0xFD
RJMP    -0x0007
SBRs    R29,0
RJMP    +0x0007
SBRc    R29,6
RJMP    +0x0011
SBRc    R29,3
RJMP    +0x0012
SBRc    R29,2
RJMP    +0x0016
RJMP    +0x0003
SBI     0x18,4
CBI     0x18,0
RET
SBI     0x18,0
CBI     0x18,4
RET
SBI     0x18,0
SBI     0x18,4
RET
CBI     0x18,0
CBI     0x18,4
RET
SBRs    R23,0
RJMP    -0x000B
RJMP    -0x0006
ANDI    R23,0x1F
CPI     R23,0x1E
BRCC    -0x0C
CP      R23,R24
BRCC    -0x0E
RJMP    -0x0012
SBRs    R23,4
RJMP    -0x0014
RJMP    -0x000F

; Read in battery voltage from ADC
IN      R26,0x4
IN      R27,0x5

SBI     0x7,1
SBI     0x6,6
ADD     R17,R26
ADC     R18,R27
RJMP    -0x0063
RJMP    -0x004E
IN      R5,0x3F

```

Fig 9

11/11

BRTC	+0x09
CPI	R21,0x31
BRCC	+0x02
ORI	R29,0x04
RJMP	+0x0004
CPI	R21,0x45
BRCC	+0x02
ANDI	R29,0xFB
RJMP	+0x0000
LDI	R21,0x49
DEC	R21
RJMP	-0x0014
CLI	
RCALL	+0x00AE
ANDI	R29,0x10
CLR	R20
OUT	0x2E,R20
SBI	0x18,4
CBI	0x18,0
SEI	
LDI	R19,0x48
AND	R19,R19
BRNE	-0x02
CLI	
LDI	R16,0x40
OUT	0x3B,R16
CBI	0x18,4
SEI	
SLEEP	
CLI	
BST	R29,4
BRTS	-0x12
LDI	R29,0x03
CLR	R3
CLR	R17
CLR	R18
CLR	R4
CLR	R28
SEI	
LDI	R16,0x80
OUT	0x7,R16
SBI	0x6,6
LDI	R22,0x78
LDI	R21,0x48
RCALL	+0x0006
AND	R21,R21
BREQ	-0x21
AND	R22,R22

Fig 9